



STATE OF MISSOURI  
DEPARTMENT OF NATURAL RESOURCES  
AIR POLLUTION CONTROL PROGRAM  
205 JEFFERSON STREET, P.O. BOX 176  
JEFFERSON CITY, MISSOURI 65102

**EMISSIONS INVENTORY QUESTIONNAIRE (EIQ)**  
**FORM 2.8 STORAGE PILE WORKSHEET**

**SHADED AREAS FOR OFFICE USE ONLY**

FACILITY NAME	FIPS COUNTY NO.	PLANT NO.	YEAR OF DATA
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**[1] STORAGE PILE INFORMATION**

POINT NO.	AIRS ID-PT	SCC	SEG NO.	TYPE OF MATERIAL STORED	
MOISTURE CONTENT (%) (DEFAULT = .07%)				AREA OF STORAGE PILE (ACRES)	
SILT CONTENT (DEFAULT = 1.6%)				RAW MATERIAL LOADING METHOD (CHECK ONE)	RAW MATERIAL UNLOADING METHOD (CHECK ONE)
STORAGE DURATION (DAYS)				<input type="checkbox"/> BARGE	<input type="checkbox"/> BARGE
ANNUAL AMOUNT STORED (TONS)				<input type="checkbox"/> RAIL	<input type="checkbox"/> RAIL
MAXIMUM HOURLY AMOUNT STORED				<input type="checkbox"/> TRUCK	<input type="checkbox"/> TRUCK
				<input type="checkbox"/> CONVEYOR	<input type="checkbox"/> CONVEYOR
				<input type="checkbox"/> OTHER (SPECIFY)	<input type="checkbox"/> OTHER (SPECIFY)

**[2] OTHER FACTORS AFFECTING EMISSION RATES**

MEAN WIND SPEED (MPH) (DEFAULT = 10 MPH)	% OF TIME WIND > 12 MPH (DEFAULT = 32%)
DRY DAYS PER YEAR (DEFAULT = 260 DAYS)	VEHICLE ACTIVITY FACTOR (DEFAULT = 1.0)

**[3] STORAGE PILE EMISSION FACTOR CALCULATIONS**

**[3-A-1] LOAD IN-LOAD OUT COMPONENT =**

$$.00224 \times \{ \text{MEAN WIND SPEED} \} / 5)^{1.3} / \{ \text{MOISTURE CONTENT (\%)} \} / 2)^{1.4}$$

LOAD IN-LOAD OUT COMPONENT

**[3-A-2] VEHICLE ACTIVITY COMPONENT =**

$$0.05 \times \{ \text{SILT CONTENT (\%)} \} / 1.5 \times \{ \text{DRY DAYS PER YEAR} \} / 235 \times \{ \text{VEHICLE ACTIVITY FACTOR} \}$$

VEHICLE ACTIVITY COMPONENT

**[3-B] WIND EROSION COMPONENT =**

$$0.85 \times \{ \text{SILT CONTENT (\%)} \} / 1.5 \times \{ \text{STORAGE DURATION (DAYS)} \} \\ \times \{ \text{DRY DAYS PER YEAR} \} / 235 \times \{ \text{\% OF TIME WIND > 12MPH} \} / 15 \text{ LB/ACRE}$$

WIND EROSION COMPONENT

**[4] STORAGE PILE PM10 EMISSION FACTOR**

$$\text{ACTIVITY PM10 EMISSION FACTOR} = \\ \{ [3-A-1] \text{ LOAD IN-LOAD OUT COMPONENT} \} + \{ [3-A-2] \text{ VEHICLE ACTIVITY COMPONENT} \}$$

[4-A] ACTIVITY PM10 EMISSION FACTOR

LB PM10/TON

[4B] WIND EROSION PM10 EMISSION FACTOR

LB PM10/ACRE

**PLEASE NOTE**

IF YOU USE A SOURCE CLASSIFICATION CODE (SCC) NUMBER AND EMISSION FACTOR FROM THE LIST IN THE INSTRUCTIONS FOR THIS FORM, MAKE SURE TO COMPLETE BLOCK 1, STORAGE PILE INFORMATION FOR EACH STORAGE PILE.

## INSTRUCTIONS

### FORM 2.8 STORAGE PILE WORKSHEET

This form is **REQUIRED** if a facility is reporting emissions from one or more open storage piles that are on the facility site.

Due to an APCP policy change in March 1998, the methodology for calculating storage pile emissions has been modified. There are now two different categories of emissions from storage piles: **(1) activity and (2) wind erosion**. The activity portion of storage pile emissions submittals includes the vehicle activity and load in/load out components and are calculated in the same manner as in previous EIQs. The wind erosion component is now calculated using pile area (**acres**) instead of **tons** stored as the throughput.

The rationale for the separation of these two categories is the physical difference in the nature of emissions from storage piles. Load in/load out and vehicle activity emissions are generated by human activity around the pile and can be represented by tons stored in the pile. However, wind erosion emissions can occur without disturbance of the pile and only occur during specific meteorological conditions.

With the use of the revised methodology, two different Source Classification Codes (SCC) are required. For quarry and associated industry storage piles, use SSC No. 3-05-020-07, Stone Quarrying, Open Storage (lb/ton) with activity emissions and use SCC No. 3-05-025-07, Sand/Gravel Storage Piles (lb/acre) with wind erosion emissions. **This will require the use of two emission point information forms (Form 2.0) for each different type of storage pile but point number should be the same.** Assign an activity SCC associated with a pound per ton emission factor to one Form 2.0 and a wind erosion SCC associated with a pound per acre emission factor to the other.

**If you want to continue using SCC No. 3-05-020-07 with the default PM<sub>10</sub> emission factor of 0.12 lb/ton for all storage pile emissions, complete all the information for Block 1, STORAGE PILE INFORMATION. If you are not using SCC emission factors, fill out this document completely.**

Use Form 2.8 to derive two emission factors for each storage pile, using various criteria inputs. When calculating the PM<sub>10</sub> emission factor for a storage pile, the following instructions apply.

Use a separate Form 2.8 for each storage pile emission point identified on Form 1.1, Process Flow Diagram and Form 1.2, Summary of Emission Points.

You may group and report separate storage piles as one point if they meet certain conditions: a) the physical characteristics of the pile and the surrounding environment are so similar that, if you calculate separate emission factors, the results would be the same; or b) the physical characteristics of the piles and the characteristics of the surrounding environment are so different that if you calculated emission factors for each pile, the results would not be equal. In this case, the reported emission factor will be the weighted average of the emission factor for each pile.

Instructions for Form 2.8  
Storage Pile Worksheet  
Continued

Activity Emission Factor Example: Suppose a facility has three distinct storage piles with annual throughputs of 100,000, 200,000 and 500,000 tons, respectively. Also assume the respective calculated PM<sub>10</sub> activity emission factors are .18, .135 and .165 lbs/ton of material stored.

$$\begin{array}{rcl} 100,000 \text{ tons} \times .18 \text{ lbs/ton} & = & 18,000 \text{ lbs.} \\ 200,000 \text{ tons} \times .135 \text{ lbs/ton} & = & 27,000 \text{ lbs.} \\ 500,000 \text{ tons} \times .165 \text{ lbs/ton} & = & 82,500 \text{ lbs.} \\ 800,000 \text{ tons} & & 127,500 \text{ lbs.} \end{array}$$

$$127,500 \text{ lbs. PM}_{10} / 800,000 \text{ tons} = .1594 \text{ lbs. PM}_{10} / \text{ton.}$$

You would enter this weighted average result of .1594 on Form 2.0 for the activity portion as the emission factor for the point.

Complete Facility Name, County Number, Plant Number and Year of Data.  
See Form 1.0 instructions, page 1.0-1.

**1) STORAGE PILE INFORMATION**

**Point Number:** This number is the unique identification number for each specific storage pile. This identification number must match the point number entered on Form 1.1, Process Flow Diagram; Form 1.2, Summary of Emission Points; and Form 2.0, Emission Point Information.

**NOTE:** Again, using the revised approach, there will be two Form 2.0 completed but the same point number will be used for each storage pile or group (one for activity and one for wind erosion).

**SCC Number for Activity:** List the SCC in tons that identifies the type of storage material for activity emissions.

**SCC Number for Wind Erosion:** List the SCC in acres that identifies the type of storage material for wind erosion emissions.

**Type of Material Stored:** Enter the type of material in the open storage pile for this emission point. Examples of some common storage pile materials include gravel, fines, pea gravel, crushed stone dust, crushed cinder, etc.

**Moisture Content of Stored Material:** Enter the moisture content of the storage pile if known. For examples, refer to Table 13.2.4-1 or Table 2.1.2-2 at the end of this instruction set. You may use a default value of 0.7% for the moisture content of the storage pile if no other information is available.

Instructions for Form 2.8  
Storage Pile Worksheet  
Continued

Use the moisture content percentage, not the decimal equivalent, when calculating the Load In-Load Out Factor in Section 3-A. Example: If the default value of 0.7% is selected, enter as .7 in the formula.

**Area of Storage Piles:** Estimate the number of acres of land that is under this specific storage pile.

**Silt Content:** Enter the Silt Content of the storage pile if known. Calculate the Silt Content by measuring the proportion of dry aggregate material that passes a 200 mesh screen, using ASTM-C-136 method. The Silt Content for some common materials stored in open storage piles are listed in Table 13.2.4-1 and Table 2.1.2-2. You may use a default value of 1.6% may be used for the storage pile if no other information is available.

Use the Silt Content percentage, not the decimal equivalent, when calculating the Wind Erosion and Activity Factors in Section 3-B and 3-C.

Example: If the default value of 1.6% is selected, enter as 1.6 in the formula.

**Storage Duration:** Enter the average number of days per year that aggregate material remains in the storage pile. Table 2.1.2-2 lists some estimates on the storage duration for various types of storage material.

**Annual Amount Stored:** Enter the total amount of all aggregate material produced and subsequently stored in the storage pile during the year. Enter tons of material stored per year.

**Maximum Hourly Amount Stored:** List the largest quantity of aggregate stored at any time during the last calendar year. Enter the maximum number of tons of material stored.

**Raw Material Loading Method:** Check the box that best corresponds to the main method of loading or removing material from the storage pile.

**Raw Material Unloading Method:** Check the box that best corresponds to the main method of unloading or adding material to the storage pile.

2) **OTHER FACTORS AFFECTING EMISSION RATES**

**Mean Wind Speed:** The statistical mean of all wind speeds at a height 10 centimeters above the storage piles, regardless of the wind direction. You may use a default value of 10 miles per hour for the Mean Wind Speed figure.

Instructions for Form 2.8  
Storage Pile Worksheet  
Continued

**Percent of Time the Wind Velocity is Greater than 12 MPH:**

The percent of time that the unobstructed wind velocity exceeds 12 miles per hour at the mean pile height. You may use a default value of 32%.

**Dry Days Per Year:** The number of days that at least 0.01 inches of rain did not fall. You may use a default value of 260 days.

**Vehicle Activity Factor:** Use the following table to select the correct value for VAF (Vehicle Activity Factor) for this storage pile. You may use a default value of 1.0.

MATERIAL	VAF VALUE
Coal	0.08
Coke	0.25
Gravel	0.25
Iron Ore	0.06
Limestone	0.25
Sand (Fines)	1.00
Slag	1.00
Top Soil (Overburden)	0.25
All Others	1.00

**3) STORAGE PILE EMISSION FACTOR CALCULATIONS**

**A.1 LOAD IN-LOAD OUT FACTOR**

The Load In-Load Out factor is a calculated number that represents the amount of PM<sub>10</sub> emissions that will result from the Load In-Load Out process. Use this formula to calculate the factor:

Load In-Load Out Factor =  
 $0.00224 \times (\text{Mean Wind Speed})^5 \times [\text{Moisture Content}(\%)]^2$  lb/ton  
(The Values 1.3 and 1.4 are exponents).

Perform the calculation for the Load In-Load Out Factor and enter the results in Block 3-A.1 of this form.

**A.2 VEHICLE ACTIVITY FACTOR**

The Activity Factor is a calculated number that represents the amount of PM<sub>10</sub> released into the atmosphere due to vehicular traffic around the storage pile. Use this formula to calculate the factor:

Instructions for Form 2.8  
Storage Pile Worksheet  
Continued

Activity Factor =

$$0.05 \times [\text{Silt Content (\%)} \div 1.5] \times (\text{Dry Days per Year} \div 235) \\ \times (\text{Vehicle Activity Factor}) \text{ lb/ton}$$

Perform the calculation for the Activity Factor and enter the results in Block 3-A.2 of this form

**B. WIND EROSION PORTION FACTOR**

The Wind Erosion Factor is a calculated number that represents the amount of PM<sub>10</sub> released into the atmosphere from this storage pile due to wind erosion. Use this formula to calculate the factor:

Wind Erosion Factor =

$$0.85 \times [\text{Silt Content (\%)} \div 1.5] \times \text{Storage Duration (Days)} \\ \times (\text{Dry Days per Year} \div 235) \times [(\% \text{ of Time Wind} > 12 \text{ MPH}) \div 15] \text{ lb/acre}$$

Perform the calculation for the Wind Erosion Factor and enter the results in Block 3-B of this form.

**4) COMBINED ANNUAL STORAGE PILE PM<sub>10</sub> EMISSION FACTORS**

(A) Add the Load In-Load Out Factor (3-A.1), and Vehicle Activity Factor (3-A.2) together and enter the result in Block 4-A of this form. When using this worksheet, always express the units as pounds of PM<sub>10</sub> emitted per ton of aggregate stored in piles.

(B) Enter the result of the calculation in Block 3-B. When using this worksheet, always express wind erosion units in pounds of PM<sub>10</sub> per acre of storage.

**ENTER THE FOLLOWING ON FORM 2.0, EMISSION POINT INFORMATION FOR THE ACTIVITY PORTION OF STORAGE PILE EMISSIONS:**

Block 1 - Enter the SCC. If you use the default SCC, enter **3-05-020-07 (lb/ton)**.

Block 7 - Enter the combined Activity PM<sub>10</sub> Emission Factor (Block 4-A) for this storage pile in the appropriate box.

Instructions for Form 2.8  
Storage Pile Worksheet  
Continued

**ENTER THE FOLLOWING ON A SEPARATE FORM 2.0, EMISSION POINT INFORMATION FOR THE WIND EROSION PORTION OF STORAGE PILE EMISSIONS:**

Block 1 - Enter the SCC. If you use the default SCC, enter **3-05-025-07 (lb/acre)**.

Block 7 - Enter the Wind Erosion PM<sub>10</sub> Emission Factor (Block 4-B) for this storage pile in the appropriate box.